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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/657,192	09/09/2003	Taro Yajima	031112	1622

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EXAMINER
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MCDONALD, RODNEY GLENN

ART UNIT	PAPER NUMBER
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1753

DATE MAILED: 03/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/657,192

Applicant(s)

YAJIMA ET AL.

Examiner

Rodney G. McDonald

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 31 January 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 31, 2006 has been entered.

### ***Allowable Subject Matter***

The indicated allowability of claim 13 is withdrawn in view of the newly discovered reference(s) to Ohno et al. (U.S. Pat. 4,851,668). Rejections based on the newly cited reference(s) follow.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 13 is rejected under 35 U.S.C. 102(b) as being anticipated by Ohno et al. (U.S. Pat. 4,851,668).

Ohno et al. teach a method of vacuum processing comprising the steps of ionizing a gas (i.e. CF<sub>4</sub>) in an ionization chamber 1 by providing an alternating current from a high frequency coil 9 to the gas to generate a plasma. A positive voltage is

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applied to a first electrode 7 in the vicinity of an opening of the ionization chamber. A negative voltage is applied to a second electrode 8 disposed farther from the ionization chamber than the first electrode 7. Positive ions are released into a vacuum chamber 2 the positive ions being extracted by the first and second electrodes 7 and 8 for producing an ion beam. Electrons are released into the chamber by electron beam generator 15 to neutralize (i.e. prevent charge accumulation). The neutralized positive ions are irradiated onto a target object 12. The plasma is regenerated in the chamber 1 by emitting electrons from the generator 15 by controlling the potential of the electrodes 7 and 8 such that electrode 8 is place at ground potential and electrode 7 has a higher positive voltage to draw the electrons into the chamber 1 for regenerating the plasma. This elongates the operation of the device. (Column 2 lines 42-68; Column 3 lines 1-64) (Compare this to Applicant's specification Pages 19 lines 7-25; Page 20 lines 1-2)

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

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not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yuzurihara et al. (U.S. Pat. 6,211,749) in view of Barnes et al. (U.S. Pat. 5,793,162).

Regarding claims 1, 9, 10, Yuzurihara et al. teach a matching box in Fig. 3. (See Fig. 3) Yuzurihara et al. teach that the RF power source 5 can be phase changed due to the voltage wave standing ratio circuit 41. (i.e. to get the ratio there are two voltages the one from the power source and the controlled one. Thus giving a phase changed voltage) (Column 7 lines 43-62) The matching box comprises a variable inductance element 45. (Column 5 line 65; Fig. 3) The variable inductance element 45 includes a main winding 45a for determining impedance of the variable inductance element. A control winding 45b is provided. The control winding is magnetically coupled to the main winding through a core 45c. (See Fig. 3; Column 5 lines 65-68; Column 6 lines 1-12) A coupled circuit changing an impedance of the impedance matching device by changing an inductance value of the main winding which depends on a magnitude of a direct current flowing in the control winding. (Column 2 lines 59-63) The voltage outputted is changed by changing the current flowing through the control winding. (Column 8 lines 32-40)

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Regarding claim 2, Yuzurihara et al. is discussed above. In Fig. 3 the first main winding 45a is connected in series between the input terminal A and the output terminal B. (See Fig. 3)

Regarding claims 3, 6, a first control power source 43 for generating a current provided to the first control winding 45a is provided. (See Fig. 3; Column 6 lines 8-12)

Regarding claims 4, 7, a first control circuit 42 provides the value of direct current to the first control power source 44. (Column 5 lines 45-52)

Regarding claim 8, Yuzurihara et al. is discussed above. Yuzurihara also teach a second variable inductance element 47 having a second main winding 47a and a second control winding 47b magnetically coupled through 47c core to the main winding 47a. (See Fig. 3) The control is based on the magnitude of direct current flowing through the second control winding. (Column 2 lines 60-63)

The differences between Yuzurihara et al. and the present claims is that controlling the impedance based upon disappearance of the plasma is not discussed (Claims 1, 12), the matching box connected to a plasma generator is not discussed (Claims 5, 8, 9), a ground side output terminal connected to ground voltage (Claims 5, 8), the variable inductor being connected between the RF source and the ground side output terminal (Claims 8, 9), the matching circuit for use for a vacuum apparatus is not discussed (Claim 9) and the vacuum chamber is not discussed (Claim 9).

Regarding controlling the impedance based upon disappearance of the plasma (Claims 1, 12), Yuzurihara et al. teach impedance matching between a radio frequency generator and a load. (See Yuzurihara et al. discussed above) Barnes teach a load

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can include a plasma discharge in a vacuum processing chamber and that a matching network be provided to maintain the plasma discharge. (See Abstract; Column 2 lines 55-63) Barnes further recognize that a matching network including two reactances one for primarily controlling the resistive impedance component seen looking into the matching network and a second for primarily controlling the reactive impedance component seen looking into the matching network. In one prior art arrangement, the variable reactances are automatically simultaneously adjusted in an attempt to minimize reflected power. The most commonly used technique for controlling the values of the variable reactances involves detecting the phase and magnitude of the impedance seen looking into the input terminals of the matching network. The reactance which primarily controls the reactive component is varied until the phase difference between the source output current and voltage is zero while the value of the reactance which primarily controls the resistive impedance component seen by the source is varied until it is as close as possible to the source output resistance. (Column 2 lines 5-21)

Regarding the matching box connected to a plasma generator (Claims 5, 8, 9), Yuzurihara et al. teach impedance matching between a radio frequency generator and a load. (See Yuzurihara et al. discussed above) Barnes teach a load can include a plasma discharge in a vacuum processing chamber. (See Barnes Abstract)

Regarding a ground side output terminal connected to ground voltage (Claims 5, 8), Barnes show that a matching circuit can have a ground output terminal. (See Figure 1)

Regarding the variable inductor being connected between the RF source and the ground side output terminal (Claims 8, 9), Since Yuzurihara et al. teach connecting to point B (See Fig. 3) and Barnes show that the R.F. source has a power output and ground side it is obvious that Yuzurihara et al. point B is connected to ground.

Regarding the matching circuit for use for a vacuum apparatus and the vacuum chamber (Claim 9), Barnes et al. teach that a matching circuit can be used in a vacuum apparatus with vacuum chamber. (See Figure 1)

The motivation for controlling the impedance is that it prevents extinguishing of the plasma. (Column 2 lines 62-63)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Yuzurihara et al. by utilizing the matching circuit in a vacuum plasma apparatus as taught by Barnes et al. because it allows for preventing extinguishing of a plasma.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yuzurihara et al. in view of Barnes et al. as applied to claims 1-10 and 12 above, and further in view of Ahonen (U.S. Pat. 5,308,461).

The difference not yet discussed is where make up of the plasma generator.

Ahonen teach a plasma generator in Fig. 4 having an ionization chamber 200 with a coil 230 wound around the ionization chamber 200. A first electrode 260 is disposed in an opening of the ionization chamber. A second electrode 262 is disposed farther than the first electrode. (See Figure 4-6) The plasma generator is an ion gun. An RF generator 320 provides an alternating current to flow through the coil and the



ions are extracted by the first and second electrodes. (Column 6 lines 20-68; Column 7 lines 25-60; Column 8 lines 1-9)

The motivation for utilizing a plasma generator that is an ion gun is that it allows providing a reliable thin film depositing device. (Column 2 lines 39-41)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized an ion gun as taught by Ahonen because it allows for providing a reliable thin film depositing device.

### ***Response to Arguments***

Applicant's arguments filed 1-31-06 have been fully considered.

Applicant's arguments with respect to Collins et al. (U.S. Pat 6,252,354) have been considered and Collins et al. has been withdrawn. New rejections are made as discussed above. The Examiner awaits the Applicant's response.


This action is made Non-Final.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rodney G. McDonald  
Primary Examiner  
Art Unit 1753

RM  
March 8, 2006